Associated Urologists of North Carolina

Treatments for Kidney and Ureteral Stones

Incidence:

Urinary stone disease affects 1 to 5% of the population. The recurrence rate for calcium oxalate stones is 10% at one year, 35% at 5 years and 50% at 10 years. Patients who form recurrent stones should be evaluated for underlying metabolic abnormalities. Recurrent kidney stones can be prevented in most cases.

Kidney Stone Treatment:

- Observation (approximately 80% of stones less than 5mm will pass spontaneously)
- Medications to dissolve the stone(s) (only applicable for uric acid and cysteine stones)
- ESWL (**E**xtracorporeal **S**hock **W**ave **L**ithotripsy)
- PCNL (**P**er**C**utaneous **N**ephrosto**L**ithotomy)
- Flexible ureteroscopy with lithotripsy (using either a laser or electrohydraulic probe)
- Open surgery

ESWL:

- ESWL is an outpatient hospital procedure that is performed in a specially equipped mobile trailer that can be used to treat either kidney or ureteral stones.
- Intravenous sedation is used to control pain.
- A dull "thumping" sensation is usually felt during the procedure. An AUNC provider first localizes the stone using x-ray. He then treats the stone with a maximum of 4000 shocks. The power level is gradually increased to the maximum level over the first 1000 shocks so that the skin can become acclimated to the shocks. Shocks are normally delivered at a rate of 125 shocks per minute.
- The shock waves are generated by electromagnetic plates contained in cushioned "shock heads" that are positioned against the skin. The shock waves can pass through soft tissue but they can't pass through stones. Therefore, the stone absorbs the shock wave energy, which causes it to break into smaller pieces. Over a period of time, ranging from days to weeks, the stone particles migrate down the ureter (tube leading from the kidney to the bladder) into the bladder. The particles are flushed from the bladder with urination.
- An ESWL procedure lasts approximately 45 minutes.
- After the procedure, you will be taken to the recovery room. Once your vital signs are stable, you will be discharged to home.
- You will be given a prescription for pain medication and a stool softener. You will also be given a prescription for a medicine called Flomax. Flomax relaxes smooth muscle in the ureter, thereby making it easier for the stone fragments to pass.

- You will be given a prescription slip for a "KUB"(stands for Kidney-Ureter-Bladder). This X-Ray study will show how completely your stone has broken up. No appointment or special preparation is necessary. A KUB can be performed in some of our offices on the day of your visit. Otherwise, follow the instructions of your AUNC provider and take the slip to the designated radiology location prior to coming to the office for your follow-up appointment. Unless the films are taken in one of our facilities, ask for a copy of a CD of your film (unless your provider can access the films remotely via the internet) and bring it with you to your follow-up appointment. If you weren't provided with a follow-up appointment, please call the office and make an appointment for approximately 2 weeks after your procedure.
- Stone fragments can vary in size from a grain of sand to larger particles. Void into a strainer every time you urinate until instructed otherwise. Bring any stone fragments you pass with you to your follow-up appointment.

Activity :

- You can resume normal activity the day following your procedure. Do not drink alcoholic beverages, drive, or operate hazardous equipment while taking narcotic pain medication.

Potential complications:

- Bleeding -
    1. Blood in your urine is normal after this procedure. It usually disappears within days.
    2. If your ureteral stone is located near the kidney, bleeding can occur around the kidney because it is in the 'blast path' used to treat the ureteral stone. For this reason, the maximum number of shocks and power level is restricted. Bleeding around the kidney is usually minor and no further treatment is required. On the other hand, if the bleeding is significant, a blood transfusion may be necessary. Signs of significant bleeding include a large area of bruising in the flank area (a small area of bruising or broken skin over the treatment area is nothing to worry about), feeling faint when bending over due to low blood pressure, grossly bloody urine which fails to clear, or severe flank pain. Promptly notify your AUNC provider's office if any of these signs occur. If you call after normal business hours, follow the instructions and call your AUNc provider's answering service and ask to speak with the on-call physician. **Blood-thinning medication and aspirin significantly increase the risk for serious bleeding during ESWL. Therefore, these medications must be stopped at least one week prior to surgery.**
- Urinary tract infections following ESWL are rare. Nevertheless, if you develop fever, chills or burning on urination, call your AUNC provider's office for further instructions.
- Persistent stone - Depending on the composition and size of the stone, it may not completely fragment. The success rate for completely fragmenting stones is approximately 80% for stones in the kidney and 70% for stones in the ureter. If the fragments are smaller than 5 mm they will usually pass. If the fragments are larger than this or if they are causing symptoms, a repeat ESWL treatment or ureteroscopic procedure (see discussion below) may be necessary.
- Obstruction – If stone fragments are too big to pass, they can obstruct the flow of urine. Urinary obstruction can cause pain, nausea, and infection.

Ureteroscopy:

Ureteroscopy is a procedure that is used to treat both ureteral and kidney stones. A ureteroscope is a specially designed instrument that is used to visualize the inside of the urinary tract. A laser fiber, pneumatic probe device, or an electrohydraulic probe can be threaded through a special channel in the ureteroscope and used to fragment a stone under direct vision. Ureteroscopy with lithotripsy is often used to treat stones that haven't responded to ESWL. In other situations, ureteroscopy may be the initial treatment of choice. For instance, stones that are smaller than 5mm and stones that are composed of uric acid cannot be effectively treated with ESWL. Furthermore, stones that are impacted in the ureter or located very near the bladder are better managed with ureteroscopy.

- Procedure: Ureteroscopy is performed in the operating room under general anesthesia. A special wire is threaded up the ureter past the stone. If the ureter is too narrow to allow passage of the ureteroscope, a special devise is used to carefully dilate the ureter. Next, the ureteroscope is negotiated up the ureter to level of the stone. The stone is then fragmented with a lithotripsy device or removed in a specially designed stone basket.
- Ureteral stent: If it is necessary to dilate the ureter, a soft silicone stent will be threaded up the ureter to prevent spasms. One end of the stent softly curls up in the kidney while the other end coils up in the bladder. As long as the stent is in place, it is normal to experience pressure in the bladder area, bloody urine, and a pressure sensation in the affected kidney every time you urinate. These sensations will resolve once the stent is removed.
- A ureteral stent may be part of a staged procedure if the stone can't be reached because of swelling around the stone or if there is a serious infection. In this situation, ureteroscopy and treatment of the stone will generally be performed several weeks later after the swelling and/or infection has had a chance to resolve.
- Depending upon the situation, a ureteral stent may left indwelling for days to weeks following the procedure. If the stent will be removed within a week of so in male patients, a string that is attached to the end of the stent will be taped to the penis. *Do not pull on the string* because doing so can dislodge the stent. The onset of urinary incontinence (constant leaking of urine) it is a sign that the stent has been dislodged and it will need to be removed. When directed to do so, the string can be removed at home by gently and continuously pulling on the string until the stent is completely removed. The stent is about a foot long. Although it may feel weird, removing the stent is not a painful procedure. Alternatively, our nurse can remove the stent in the office.
- The stent will need to be removed in the office in women, and in men whose stent will remain indwelling for longer than a week. A special instrument called a cystoscope is gently passed through the urethra into the bladder. A grasping forcep is then used to grasp and remove the stent.
- In addition to the complications listed above for ESWL, possible complications following ureteroscopic procedures include perforation of the ureter (hole in the ureter), stricture of the ureter (scar tissue in the ureter) or other damage to the lining of the ureter. These

complications are rare and usually respond to conservative measures such as leaving a ureteral stent in place until the area has healed. Occasionally further corrective surgery is necessary.

PCNL:

- PCNL, which stands for ***per**cutaneous **n**ephrosto**l**ithotomy*, is primarily used to treat kidney stones. A PCNL procedure is performed in the hospital operating room under general anesthesia.
- Prior to your PCNL procedure, a radiologist will insert a special tube, called a nephrostomy tube, into your affected kidney. A nephrostomy tube is about the size of a cocktail straw. This procedure is performed in the radiology department. Local anesthesia and intravenous sedation is given to minimize discomfort.
- A foley catheter is inserted into your bladder once you're asleep to keep your bladder from becoming over distended during the procedure. The catheter is usually removed the day after your surgery.
- At the time of surgery, your AUNC provider will next insert a flexible guide wire through the nephrostomy tube into the bladder and dilate the tract with a special balloon catheter.
- Once the tract has been adequately dilated, a smooth tapered sheath is slipped over the balloon catheter into the kidney. The balloon catheter is then withdrawn.
- A special instrument, called a nephroscope, is then passed through the lumen of the sheath into the kidney. Fluid constantly runs through the nephroscope and a high intensity light at the tip of the nephroscope allows your AUNC provider to visualize the inside of your kidney and treat your stone.
- The stone is fragmented with a special wand that uses ultrasound and electrohydraulic energy to fragment the stone. The fragments are then extracted using a grasping forcep or they are aspirated through the ultrasonic devise.
- Once all of the fragments have been removed, a new nephrostomy tube is placed.
- A PCNL procedure normally takes several hours to perform.
- Once the urine is no longer bloody, you will be scheduled for a special x-ray study called a nephrostogram. This test is usually performed on the first or second day following surgery. Dye is injected into the nephrostomy tube to make sure that there is no leakage outside the kidney and also to look for any remaining stone fragments. If everything appears normal, the nephrostomy tube is plugged overnight. The nephrostomy tube will be unclamped if flank pain or fever develops. If everything is okay overnight, the tube is removed the following morning and you are discharged home.
- If there is leakage from the kidney, the nephrostomy tube is left in place and a repeat x-ray is taken in a week or so. Once the leakage has resolved, the tube is removed.
- If the nephrostogram shows remaining stone fragments that are small enough to pass on their own, the nephrostomy tube can be removed. On the other hand, if there are remaining stone fragments that are too big to pass, it may be necessary to repeat the PCNL procedure (using the same tract) or ESWL may be performed. In either case, the nephrostomy tube is usually not removed until after the residual stone fragments have been treated.

- After the nephrostomy tube has been removed, is normal to leak urine from the skin incision for a day or so. Keep a gauze pad over the site until the drainage ceases. Apply Neosporin ointment twice daily to the incision site until it has healed.
- You will normally be discharged on the second or third day following surgery.
- You will be sent home with a prescription for a pain medication and an antibiotic.

Activity :

- You can eat a normal diet, shower and move about as tolerated. It's advisable to wait until after you've had your follow-up appointment with our office before driving or returning to work. In order to prevent delayed bleeding from the kidney, you should avoid any strenuous activity for at least several weeks following surgery.

Potential complications:

- Bleeding - blood in your urine is normal after this procedure. It usually resolves within a matter of days.
- Injury to the artery or vein leading to the kidney or structures surrounding the kidney may occur during initial placement of the nephrostomy tube or during dilation of the tract at the time of surgery. This can usually be managed conservatively by merely placing a nephrostomy tube and inflating a balloon to stop the bleeding. Although extremely rare, an emergency open operation may be necessary if the bleeding can't be stopped. If all other measures fail, an emergency nephrectomy (removal of the kidney) may be required.
- Infection – although you will be treated with antibiotics before and after your procedure, an infection can still occur. If you develop signs of an infection in the skin surrounding your incision or if you experience fever, chills, or burning on urination, call our office for further instructions.
- Obstruction - Stone fragments that are too big to pass may become stuck in the ureter and require an additional surgical procedure.
- Aborted procedure: If the stone can't be visualized due to excessive bleeding, it may be necessary to abort the procedure and insert a nephrostomy tube. In this situation, the surgery will need to be rescheduled, typically a week or so later, which will allow time for the bleeding to stop and for the tract to mature. It will not be necessary to reinsert another tube in radiology prior to the subsequent procedure.
- Persistent stone - Depending on the composition and size of your stone, it may not completely fragment. Furthermore, it may not be possible to complete the procedure if the stone migrates to or is located in a portion of the kidney that is inaccessible. The success rate for completely fragmenting your stone is approximately 80-85%. If the fragments are smaller than 5 mm they may pass on their own. If the fragments are larger than this or if they are causing symptoms, another PCNL treatment or other surgical procedure may be necessary.